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New Species of the Genus *Pheretima* s. lat. (Annelida, Oligochaeta, Megascolecidae) from Tokyo, Japan—Part II. Species with Serrate Intestinal Caeca

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Abstract In the second series of the study on the genus *Pheretima* s. lat. (family Megascolecidae) collected from Tokyo, a group of the species with serrate intestinal caeca is dealt with and 10 new species are described here: *Pheretima autumnalis*, *Ph. montana*, *Ph. atrorubens*, *Ph. alpestris*, *Ph. dura*, *Ph. turgida*, *Ph. argentea*, *Ph. imajimai*, *Ph. confusa*, and *Ph. nipparensis*.

Key words: Megascolecidae, *Pheretima* s. lat., new species, Tokyo.

Introduction

Forty seven undescribed species of the genus *Pheretima* s. lat. were found from Tokyo. Among them, 11 new species with manicate intestinal caeca were described in the first part (Ishizuka, 1999 a). In part II, 10 new species with serrate intestinal caeca are described.

***Pheretima autumnalis* sp. nov.**

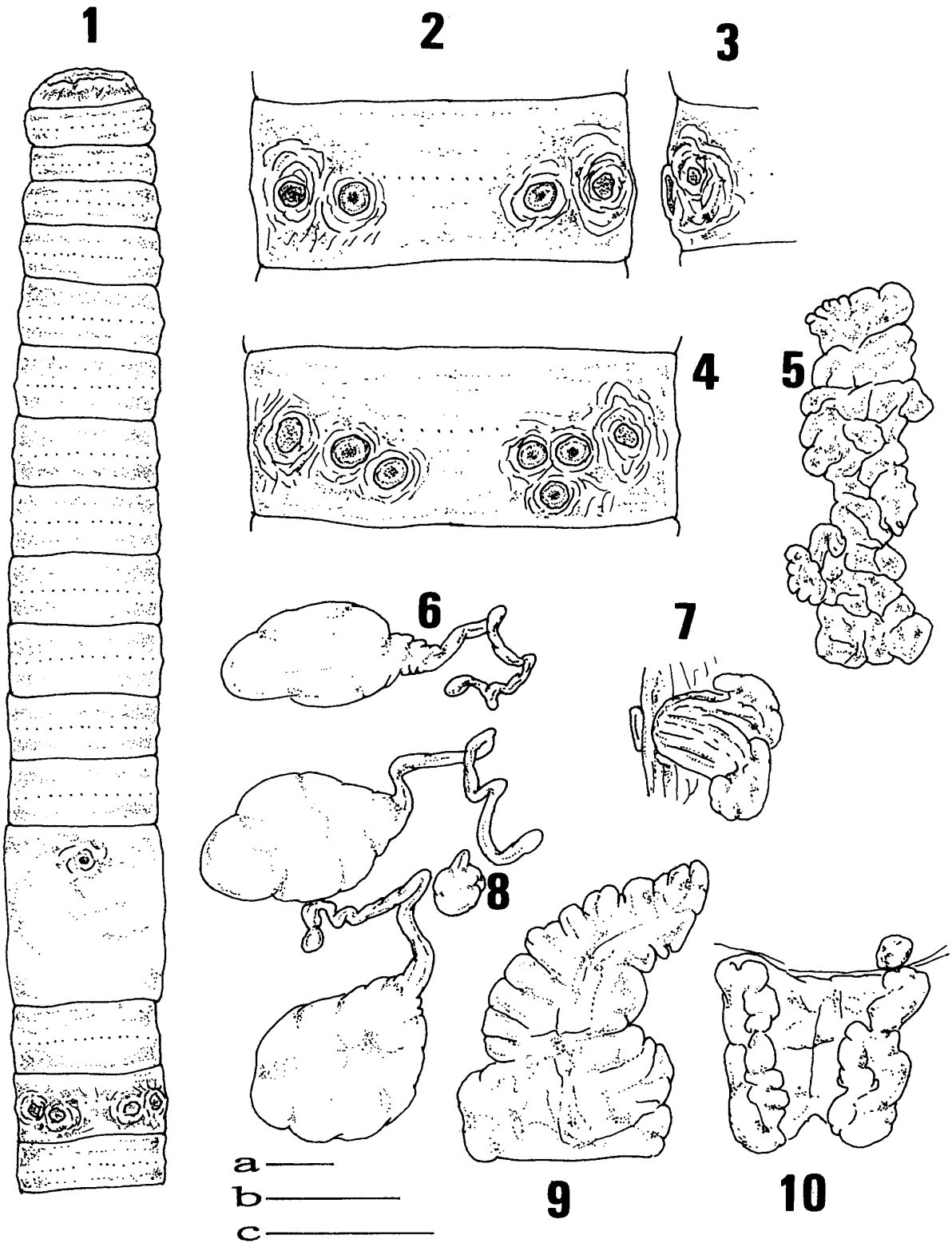
[New Japanese name: Aki-mimizu]

(Figs. 1–10, Tables 1, 6)

Description. Body. Length 95–155 mm, width 3.3–4.3 mm. Number of segments 76–96. Reddish dark brown dorsally, light yellowish grey ventrally.

External characters. Three pairs of spermathecal pores situated in furrows 5/6/7/8 in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings paired, circular sucker-shape; postclitellar median to the line of the male pores, postsetal on segment XVII and occasionally pre- and postsetal on segment VII, variable in the number. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 10/11. Clitellum including segments XIV–XVI. Setal number 44–45 in segment VII, 62–66 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 2–3 segments. Genital glands, glandular masses (duct present), associated with genital markings restricted to body wall. Septa absent



Figs. 1–10. *Pheretima autumnnalis* sp. nov. 1–3, 5–10: Holotype (NSMT-An 261), 4: Paratype (NSMT-An 262). 1: Ventral view of anterior body. 2, 4: Male pores and genital markings on segment XVIII. 3: Lateral view of segment XVIII. 5: Prostate gland with a duct and genital gland. 6: Spermathecae. 7–8: Genital gland. 9: Intestinal caecum. 10: Dorsal view of seminal vesicles. (Scale bars. a: 1 mm for 1, 5, 10, b: 1 mm for 2–4, 6, 8, c: 1 mm for 7, 9.)

Table 1. The number, arrangement and position of fenital papillae of *Ph. autumnalis* sp. nov.
Twelve individuals from Higashi-kurume City.

No.	Segment		No.	Segment		No.	Segment	
	VII	XVIII		VII	XVIII		VII	XVIII
1	1 pair	2 and 3*	5	one side	1 pair	9	0	1 pair
2	1 and 2	2 and 3	6	0	2 pair	10	0	1 pair
3	1 pair	1 pair	7	0	1 and 2	11	0	1 pair
4	one side	1 and 2	8	0	1 pair	12	0	0

* Two on the side and three on the other side.

in 8/9/10, thickened in 5/6/7/8 and 10/11/12/13/14. Three pairs of spermathecae in segments VI–VIII; ampulla consisting of a large pouch and a slender duct; diverticulum consisting of a small oval pouch and a twisted duct. Seminal vesicles large, extending to the dorsal line in segments XI–XII. Prostata large, extending through segments XVII–XXII, corresponding to male pore.

Material examined. Holotype (NSMT-An 261) and 5 paratypes (NSMT-An 262): Higashi-kurume City, 13–X–1998, K. Ishizuka, from soil under a grassy place. Other specimens examined: 6 exs. same data as type series.

Remarks. The new species resembles *Pheretima divergens* (Michaelsen, 1892), but is distinguishable from the latter species by (1) three pairs of spermathecal pores, and (2) absence of preclitellar, genital markings.

***Pheretima montana* sp. nov.**

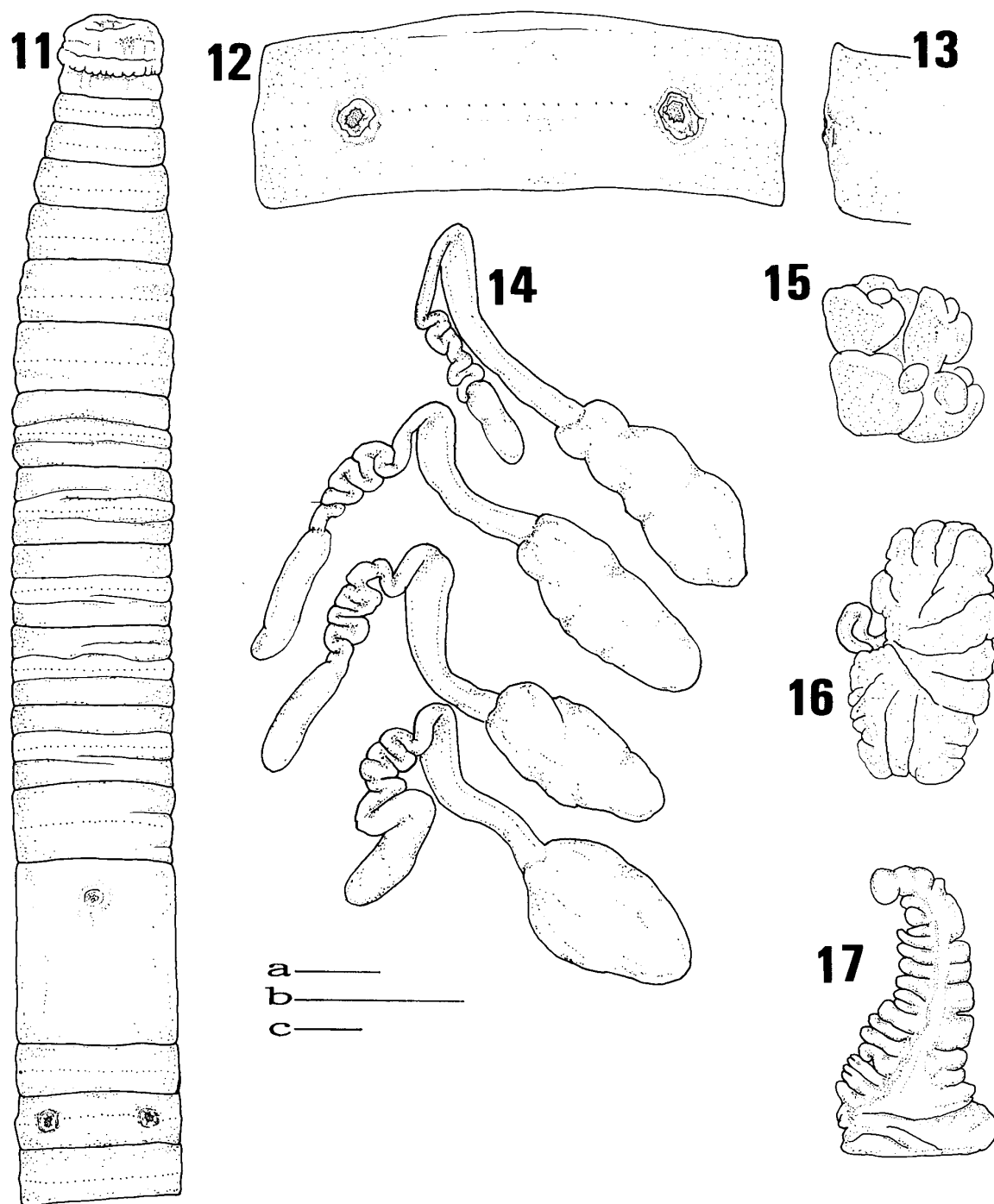
[New Japanese name: Yama-mimizu]

(Figs. 11–17)

Description. Body. Length 148–248 mm, width 6.2–8.6 mm. Number of segments 126–132. Reddish dark brown dorsally, light reddish brown ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. 1/4 body circumference. Genital markings absent. Male pores simple, on small-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/4 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 52–57 in segment VII, 66–72 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4 segments. Genital glands absent. Septa absent in 8/9/10, very thickened in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; di-



Figs. 11–17. *Pheretima montana* sp. nov. Holotype (NSMT-An 263). 11: Ventral view of anterior body. 12: Male pores on segment XVIII. 13: Latetal view of segment XVIII. 14: Spermathecae. 15: Dorsal view of seminal vesicles. 16: Prostate gland with a duct. 17: Intestinal caecum. (Scale bars. a: 5 mm for 11, 15–16, b: 5 mm for 17, c: 1 mm for 12–14.)

verticulum consisting of a sausage-shaped pouch and a narrow convoluted duct. Seminal vesicles large, extending to the dorsal line in segments XI–XII. Prostata large, extending through in segments XVI–XXI, corresponding to male pore.

Material examined. Holotype (NSMT-An 263) and 3 paratypes (NSMT-An 264): Ohtanba Valley, 30–VIII–1985, K. Ishizuka. On a road just after the rain and in the gutter under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 ex. with same data as the type series. 3 exs. Mizunesawa, 8–IX–1985. 2 exs. Mt. Nanatsuishiyama. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima grossa* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) absence of genital markings, (2) absence of genital glands, (3) racemose shaped prostate glands (fan-shaped in *Ph. grossa*), and (4) small male pores, separated by a distance of ca. 1/4 body circumference.

***Pheretima atrorubens* sp. nov.**

[New Japanese name: Takao-mimizu]

(Figs. 18–24, Table 2)

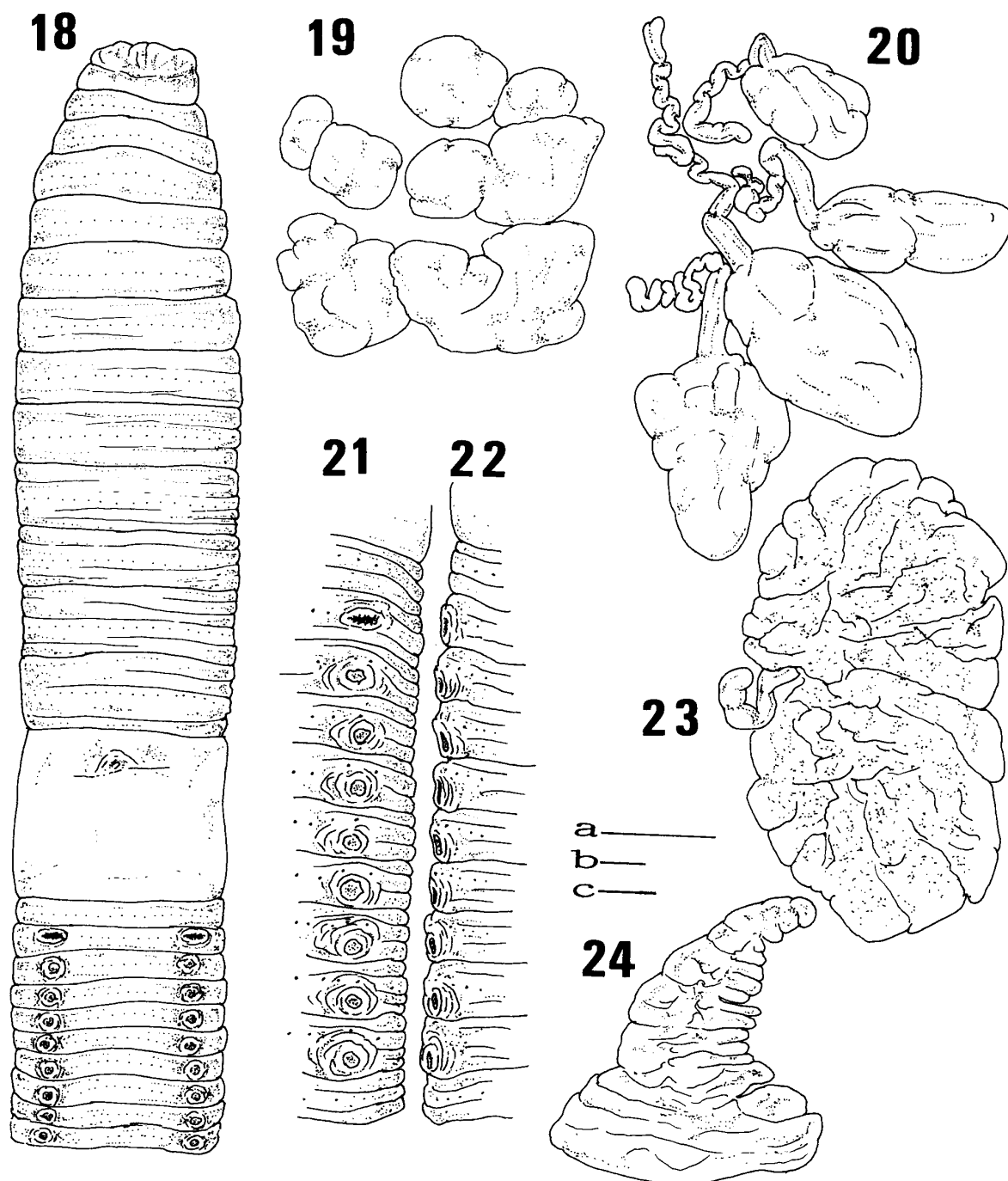
Description. Body. Length 200–220 mm, width 10–11 mm. Number of segments 110–134. Dark reddish brown dorsally, light reddish brown ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings absent. External markings (genital glands absent) paired, circular sucker-shape; postclitellar in line with the male pore, postsetal on segments XVIII–XXVI, variable in the number. Male pores large, simple, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13 or 11/12. Setal number 60–66 in segment VII, 80–90 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 6–7 segments. Intestine begins in XV. Genital gland absent. Septa absent in 8/9/10, very thickened and muscular in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum, a narrow convoluted duct. Seminal vesicles large, extending to the dorsal line in segments XI–XII. Prostata extending through segments XV–XXII, associated with the male pore.

Material examined. Holotype (NSMT-An 265) and 5 paratypes (NSMT-An 266): On a road just after the rain under a mixed forest of evergreen and deciduous trees, Mt. Takao, 14–X–1998, K. Ishizuka. Other specimens examined : 5 exs. with same data as the type series.

Remarks. The new species resembles *Pheretima grossa* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) serriform in ventral of the intesti-



Figs. 18–24. *Pheretima atrorubens* sp. nov. Holotype (NSMT-An 265). 18: Ventral view of anterior body. 19: Dorsal view of seminal vesicles. 20: Spermathecae. 21: Male pore and external markings on segment XVIII–XXVI. 22: Lateral view of segment XVIII–XXVI. 23: Prostate gland with a duct. 24: Intestinal caecum. (Scale bars. a: 5 mm for 18, b: 1 mm for 19–20, 23, c: 1 mm for 21–22, 24.)

nal caeca, and (2) racemose shaped prostate glands (fan-shaped prostate glands in *Ph. grossa*).

***Pheretima alpestris* sp. nov.**

[New Japanese name: Karamatsu-mimizu]

(Figs. 25–32, Table 2)

Description. Body. Length 103 mm, width 4.4 mm. Number of segments 126. Dark brown dorsally, yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides separated by a distance of ca. 1/3 body circumference. Genital markings, paired, circular sucker-shaped; postclitellar in line with the male pores, postsetal on segments XIX–XXIII. Male pores, simple, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 46 in segment VII, 50 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 5 segments. Intestine begins in XV. Genital glands, paired, glandular masses, in segment XVIII, associated with genital markings restricted to body wall. Septa absent in 8/9/10, very thickened and muscular in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum, a long convoluted tube. Seminal vesicles, extending in segments XI–XII. Prostata, extending through segments XVI–XXI, ducts corresponding to the male pores.

Material examined. Holotype (NSMT-An 267): From soil under a mixed forest of evergreen and deciduous trees, Mt. Kumotori, 8–IX–1986, K. Ishizuka.

Remarks. The new species resembles *Pheretima grossa* (Goto & Hatai, 1898), but is distinguishable from the latter species by (1) racemose-shaped prostate glands (fan-shaped prostate glands in *Ph. grossa*), and (2) the small body length 108 mm (220–330 mm in *Ph. grossa*).

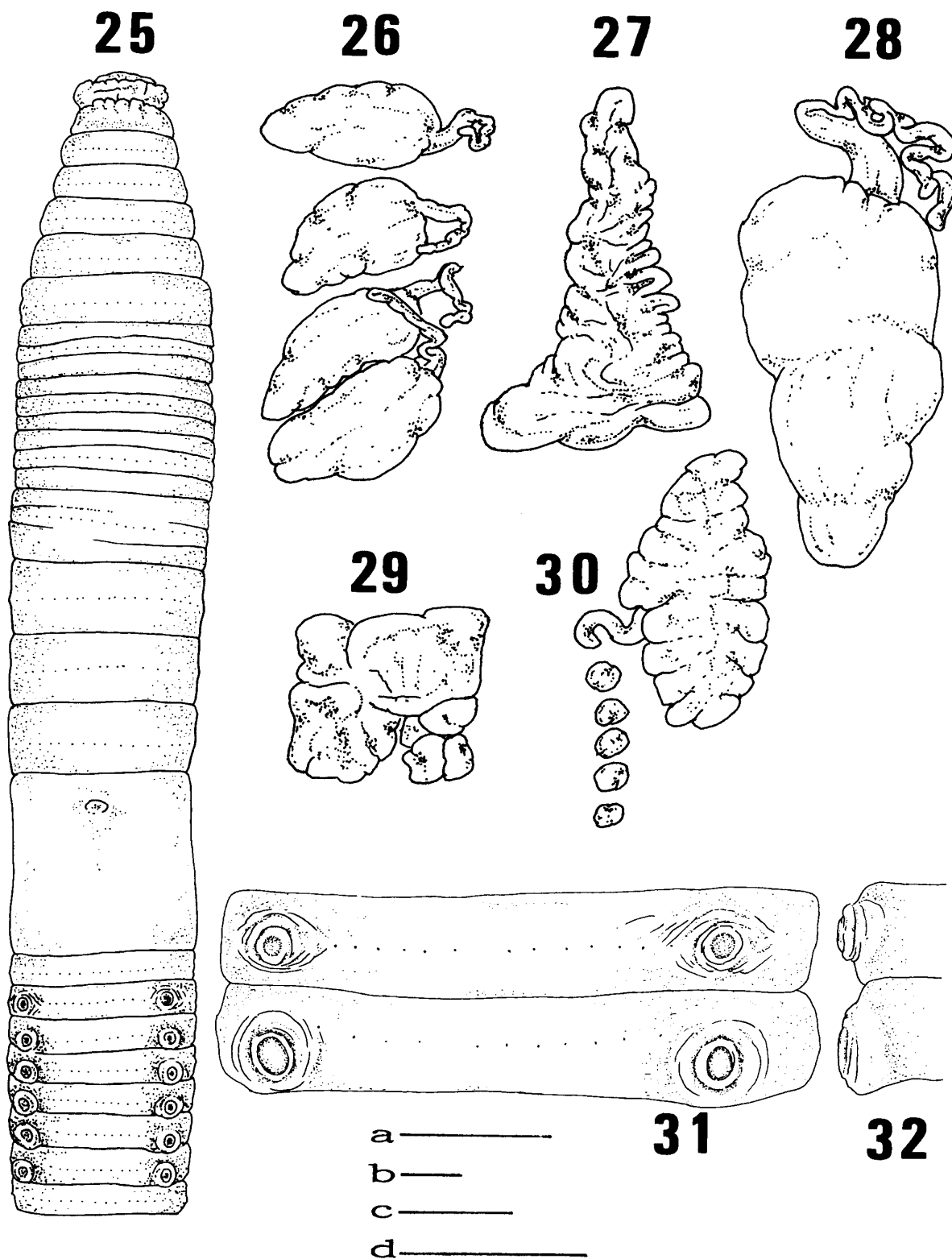
***Pheretima dura* sp. nov.**

[New Japanese name: Hagane-mimizu]

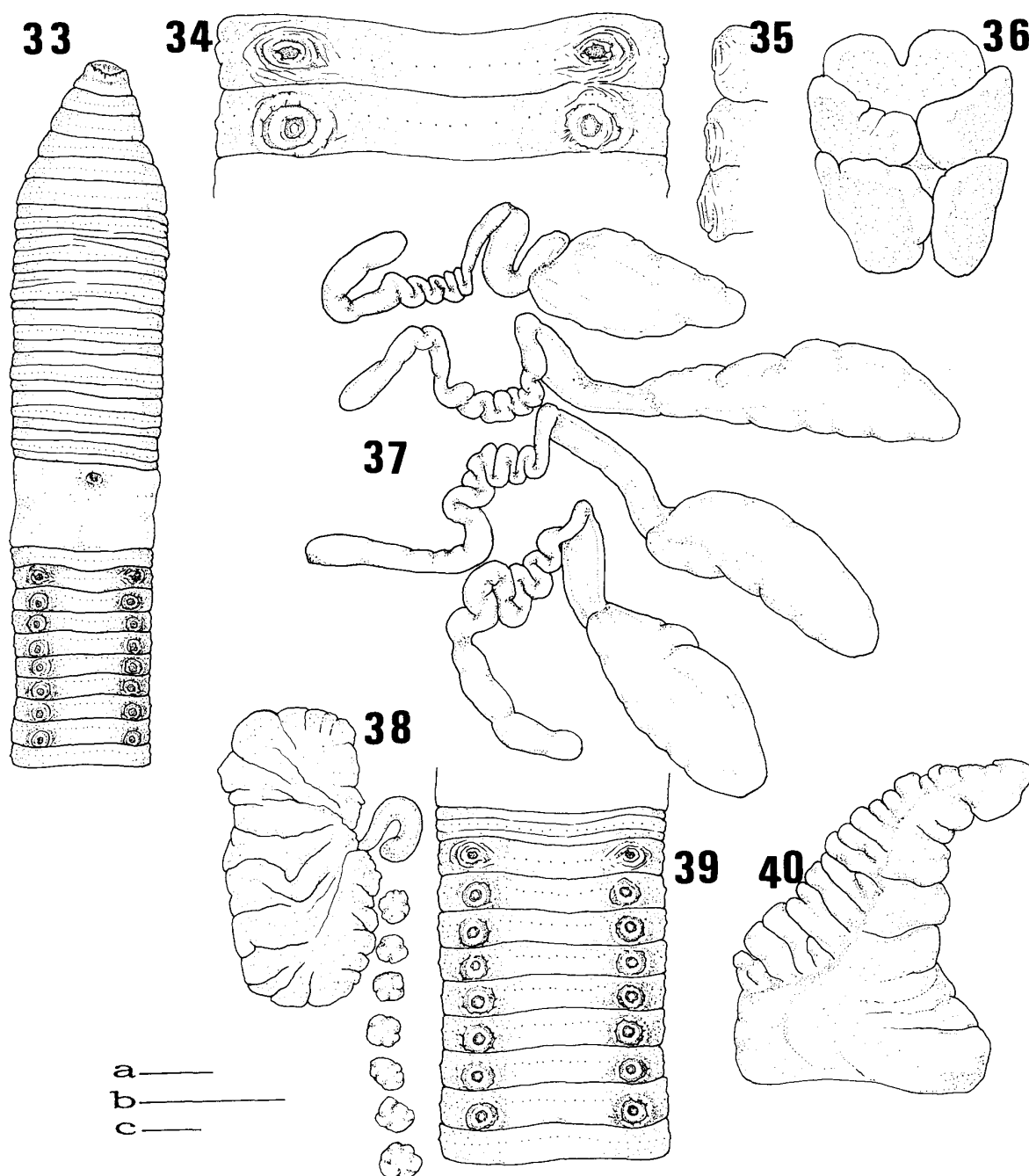
(Figs. 33–40, Table 2)

Description. Body. Length 130–180 mm, width 7.0–9.0 mm. Number of segments 130–132. Reddish dark brown dorsally, light brown ventrally.

External characters. Four pairs of spermathecal pore situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings paired, circular sucker-shape; postclitellar in line with the male pores, postsetal on segments XIX–XXV and occasionally XXVI or XXVII. Male



Figs. 25–32. *Pheretima alpestris* sp. nov. Holotype (NSMT-An 267). 25: Ventral view of anterior body. 26, 28: Spermathecae. 27: Intestinal caecum. 29: Dorsal view of seminal vesicles. 30: Prostate gland and glandular masses. 31: Male pores and genital markings on segments XVIII–XIX. 32: Lateral view of segments XVIII–XIX. (Scale bars. a: 5 mm for 25, b: 1 mm for 26, 29, 30, c: 1 mm for 27, 31–32, d: 1 mm for 28.)



Figs. 33–40. *Pheretima dura* sp. nov. Holotype (NSMT-An 269). 33: Ventral view of anterior body. 34: Male pores on segment XVIII and genital markings on segment XIX. 35: Lateral view of segments XVIII–XIX. 36: Dorsal view of seminal vesicles. 37: Spermathecae. 38: Prostate gland and glandular masses. 39: Male pores on segment XVIII and genital markings on segments XIX–XXV. 40: Intestinal caecum. (Scale bars. a: 5 mm for 33, b: 5 mm for 36, 38–39, c: 1 mm or 34–35, 37, 40.)

pores large, simple, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Setal number 48–52 in segment VII, 64–70 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XVI. Genital glands large, paired, glandular masses, on segments XIX–XXV and occasionally XXVI or XXVII, associated with genital markings restricted to body wall. Septa absent in 8/9/10, very thickened in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae, in segments VI–IX; ampulla consisting of a long shovel-shaped pouch and a thick duct; diverticulum consisting of a sausage-shaped pouch and a convoluted duct. Seminal vesicle large, extending in segments XI–XII. Prostata large, extending through segments XVI–XX, ducts corresponding to the male pores.

Material examined. Holotype (NSMT-An 268) and 3 paratypes (NSMT-An 269): Mt. Tsukiyomi, 8–VIII–1981, K. Ishizuka, on a road just after the rain and in the gutter under a mixed forest of evergreen and deciduous trees. Other specimens examined: 2 exs. with same data as the type series. 1 ex. Mt. Mitake, 21–IX–1985. 2 exs. Mt. Takao, 31–VII–1985. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima grossa* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) racemose shaped prostate glands (fan-shaped prostate glands in *Ph. grossa*), and (2) the body length 130–180 mm (220–330 mm in *Ph. grossa*).

***Pheretima turgida* sp. nov.**

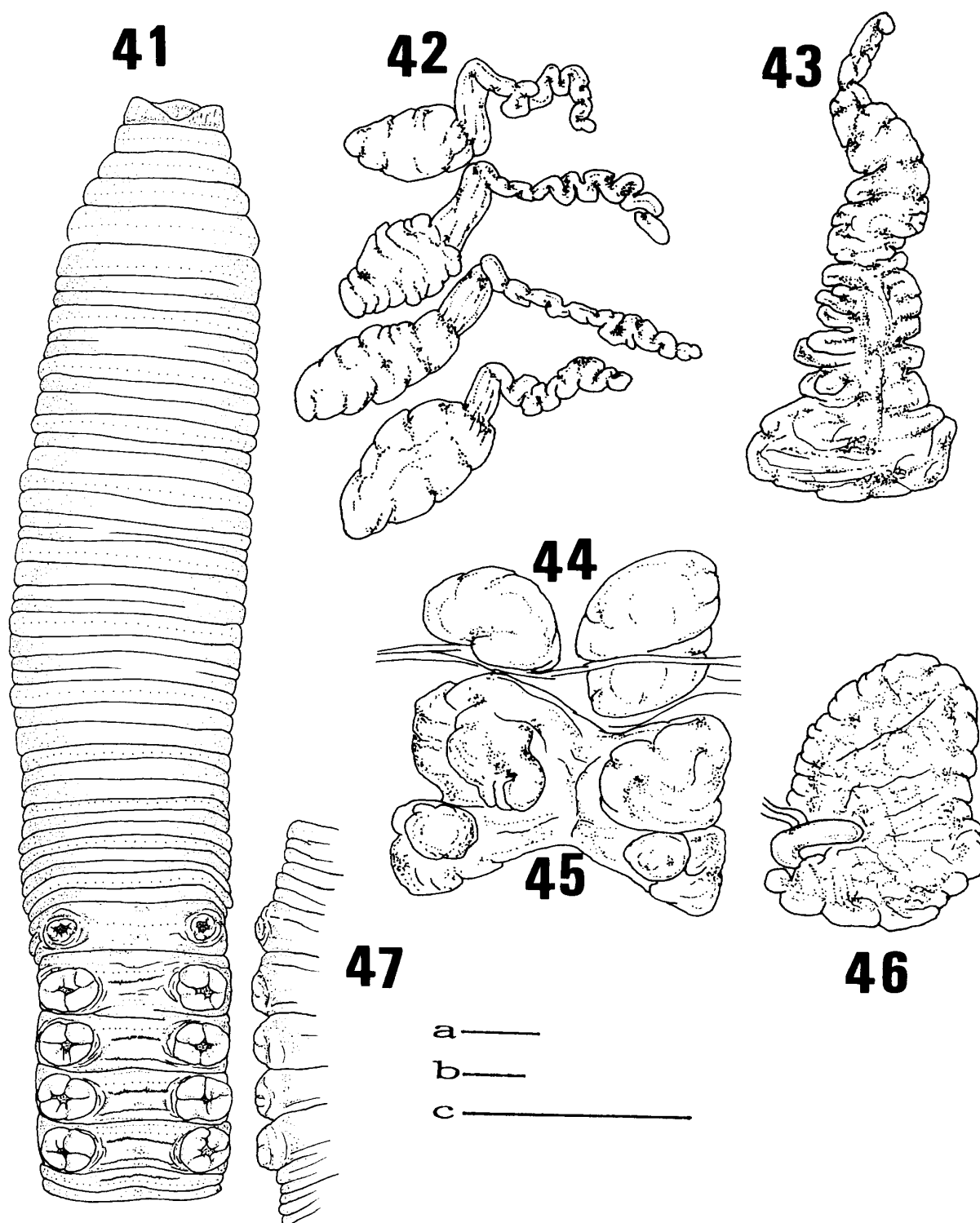
[New Japanese name: Ohfusa-mimizu]

(Figs. 41–47, Table 2)

Description. Body. Length 260 mm, width 12 mm. Number of segments 130–144. Reddish brown dorsally, light reddish brown ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. 1/3 body circumference. Genital markings absent. External markings (genital glands absent) very large, paired, circular to ovate grinder-shape; postclitellar in line with the male pores, postsetal on segments XIX–XXII. Male pores large, simple, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 60–66 in segment VII, 64–70 in segment XX.

Internal characters. Serrate intestinal caeca paired, originating in segment XXVII, extending anteriorly for 7 segments. Intestine begins in XVI. Genital glands absent. Septa absent in 8/9/10, very thickened and muscular in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-



Figs. 41–47. *Pheretima turgida* sp. nov. Holotype (NSMT-271). 41: Ventral view of anterior body. 42: Spermathecae. 43: Intestinal caecum. 44: Testes. 45: Dorsal view of seminal vesicles. 46: Prostate gland with duct. 47: Lateral view of segments XVI–XXIII. (Scale bars. a: 5 mm for 41, 47, b: 1 mm for 42–43, 46, c: 5 mm for 44–45.)

el-shaped pouch and a thick duct; diverticulum, a long convoluted tube. Seminal vesicles large, extending to the dorsal line in segments XI–XII. Prostata large, extending through segments XVII–XX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 270) paratype (NSMT-An 271): Mt. Takao, 23–VIII–1981, K. Ishizuka, on a road just after the rain and in the gutter under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 exs. Mt. Takao, 4–VIII–1986, K. Ishizuka.

Remarks. The new species resembles *Pheretima grossa* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) absence of genital glands, (2) very large external markings, and (3) racemose shaped prostate glands (fan-shaped in *Ph. grossa*). The very large external markings are very conspicuous and make the character of new species.

***Pheretima argentea* sp. nov.**

[New Japanese name: Giniro-mimizu]

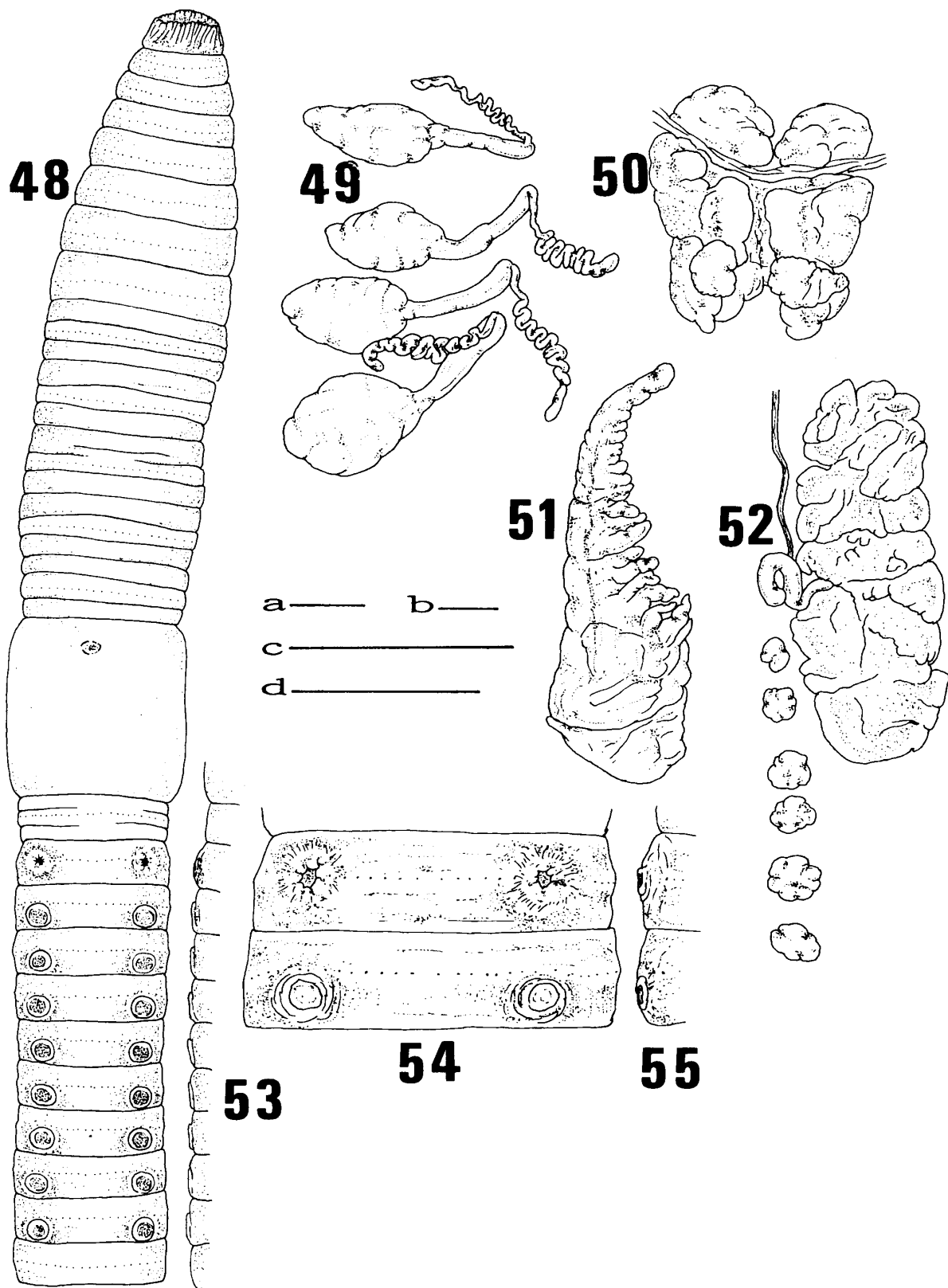
(Figs. 48–55, Table 2)

Description. Body. Length 258 mm, width 9.2 mm. Number of segments 109. Dark brown dorsally, greyish white ventrally. The dark brown dorsal face gives out the luster of a silvery light.

External characters. Four pairs of spermathecal pores small, situated in fur-

Table 2. Characters of the seven related species with four pairs spermathecal pores of the genus *Pheretima*.

	Intestinal caeca	Genital markings	Genital glands	Body length	Dorsal coloration
<i>Ph. grossa</i> (Goto et Hatai)	Serriform in both sides	On segments XIX–XXI	Present	220–330 mm	Dark brown
<i>Ph. iizukai</i> (Goto et Hatai)	Serriform in both sides	On segments XIX–XXV	Present	220–350 mm	Brown
<i>Ph. atrorubens</i> sp. nov.	Serriform in ventral	Absent	Absent	200–220 mm	Reddish dark brown
<i>Ph. alpestris</i> sp. nov.	Serriform in ventral	On segments XIX–XXIII	Present	100–110 mm	Dark brown
<i>Ph. dura</i> sp. nov.	Serriform in dorsal	On segments XIX–XXV	Present	130–180 mm	Reddish dark brown
<i>Ph. turgida</i> sp. nov.	Serriform in both sides	Absent	Absent	260 mm	Reddish brown
<i>Ph. argentea</i> sp. nov.	Serriform in ventral	On segments XIX–XXVI	Present	258 mm	Dark brown



Figs. 48–55. *Pheretima argentea* sp. nov. Holotype (NSMT-An 272). 48: Ventral view of anterior body. 49: Spermathecae. 50: Dorsal view of testes and seminal vesicles. 51: Intestinal caecum. 52: Prostate gland and glandular masses. 53: Lateral view of segments XVII–XXVII. 54: Male pores on segment XVIII and genital markings on segment XIX. 55: Lateral view of segments XVIII–XIX. (Scale bars. a: 5 mm for 48, 53, b: 1 mm for 54–55, c: 5 mm for 49, 51, d: 5 mm for 50, 52.)

rows 5/6/7/8/9 in ventro-lateral sides, separated by a distance of ca. $1/3$ body circumference. Genital markings paired, circular sucker-shape; postclitellar in line with the male pores, postsetal on segments XIX–XXVI. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. $1/3$ body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 11/12. Clitellum including segments XIV–XVI. Setal number 60 in segment VII, 68 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 4–6 segments. Intestine begins in XV. Genital glands large, paired, glandular masses, in segments XIX–XXVI, associated with genital markings restricted to body wall. Septa absent in 8/9/10, very thickened and muscular in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum, a long convoluted tube. Seminal vesicle, extending in segments XI–XII. Prostata large, extending through segments XVI–XX, ducts corresponding to male pores.

Material examined. Holotype (NSMT-An 272): Mt. Takao, 22–VI–1981, K. Ishizuka, on a road just after the rain under a mixed forest of evergreen and deciduous trees. Other specimens examined: 1 ex. Mt. Takao, 15–IX–1985, K. Ishizuka.

Remarks. The new species resembles *Pheretima grossa* (Goto et Hatai, 1898), but is distinguishable from the latter species by (1) serriform in ventral of the intestinal caeca, (2) racemose shaped prostate glands (fan-shaped prostate glands in *Ph. grossa*), and (3) the dark brown dorsal face gives out the luster of a silvery light in life. The luster of a silvery light are very conspicuous and make the character of new species.

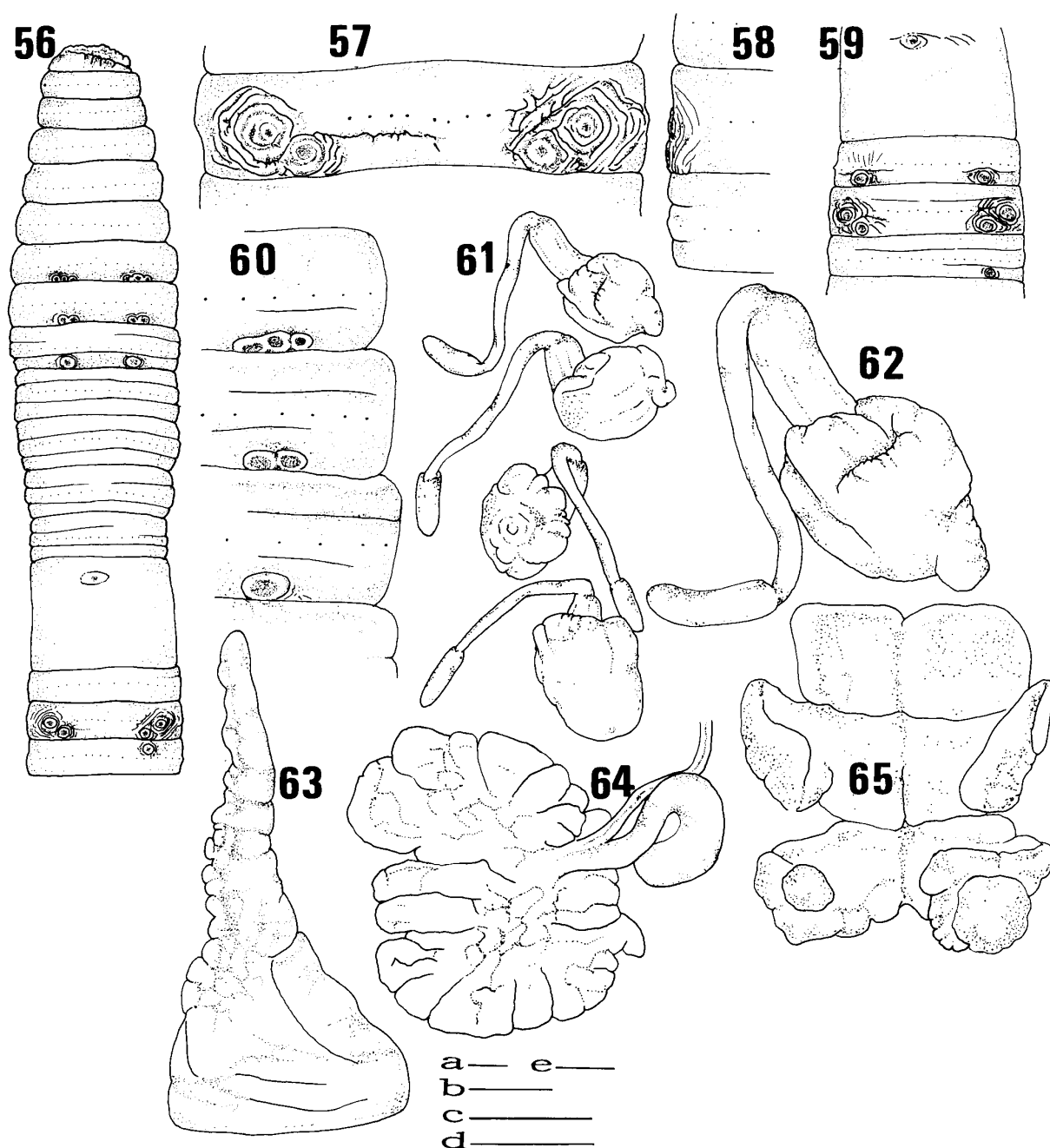
***Pheretima imajimai* sp. nov.**

[New Japanese name: Imajima-mimizu]

(Figs. 56–65, Table 3)

Description. Body. Length 210–260 mm, width 6.7–7.6 mm. Number of segments 120–137. Light yellowish brown dorsally, yellowish grey ventrally; a reddish dark brown band in intersegmental furrows showing a banded pattern in appearance.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9, in ventro-lateral sides, separated by a distance of ca. $1/3$ body circumference. Genital markings absent. External markings (genital glands absent) paired, circular sucker-shape; preclitellar median to the line of the spermathecal pore, postsetal on segments VII–IX, variable in the number; postclitellar slightly median to the line of the male pores, closely associated with the male pores, pre- and postsetal on segment XVIII and occasionally XVII, XIX, variable in the number. Male pores large, simple, superficial on segment XVIII, separated by a distance of ca. $1/3$ body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in fur-



Figs. 56–65. *Pheretima imajimai* sp. nov. Holotype (NSMT-An 273). 56: Ventral view of anterior body. 57: Male pores and external markings on segment XVIII. 58: Lateral view of segment XVIII. 59: Male pores on segment XVIII and external markings on segments XVII–XIX. 60: Lateral view of segments VII–IX. 61–62: Spermathecae. 63: Intestinal caecum. 64: Prostate gland with a duct. 65: Dorsal view of testes and seminal vesicles. (Scale bars. a: 1 mm for 59, b: 1 mm for 57–58, 60, 63, c: 5 mm for 56, d: 1 mm for 62. e: 1 mm for 60–61, 64–65.)

Table 3. The number, arrangement and position of genital papillae of *Ph. imajimai* sp. nov. Ten individuals from National Science Museum, Tokyo.

No.	Preclitellar			Postclitellar		
	VII	VIII	IX	XVII	XVIII	IX
1	3 pairs	2 pairs	1 and 2	0	1 pair	0
2	1 pair	1 pair	0	0	one side	0
3	1 pair	1 pair	1 pair	1 pair	1 pair	one side
4	1 pair	one side	1 pair	0	1 pair	0
5	one side	1 pair	1 pair	0	1 pair	0
6	1 pair	2 pairs	1 pair	0	1 pair	0
7	1 pair	1 pair	0	0	1 pair	0
8	1 pair	1 pair	0	0	1 pair	0
9	one side	one side	one side	0	1 pair	0
10	one side	1 pair	1 pair	0	1 pair	0

row 12/13 or 11/12. Setal number 38–46 in segment VII, 48–55 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XV. Genital gland absent. Septa absent in 8/9/10, very thickened and muscular in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a small sausage-shaped pouch and a long duct. Seminal vesicles small, extending to the dorsal line in segments XI–XII. Prostata extending through segments XVII–XIX, associated with the male pores.

Material examined. Holotype (NSMT-An 273) and 5 paratypes (NSMT-An 274): National Science Museum (Hyakunincho, Shinjuku-ku), 15-X-1984, M. Imajima, on a road just after the rain under a mixed forest of evergreen and deciduous trees. Other specimens examined: 6 exs. with same data as the type series.

Remarks. The new species resembles *Pheretima pingi* Stephenson 1925, but is distinguishable from the latter species by (1) absence of genital gland, and (2) serrate intestinal caeca.

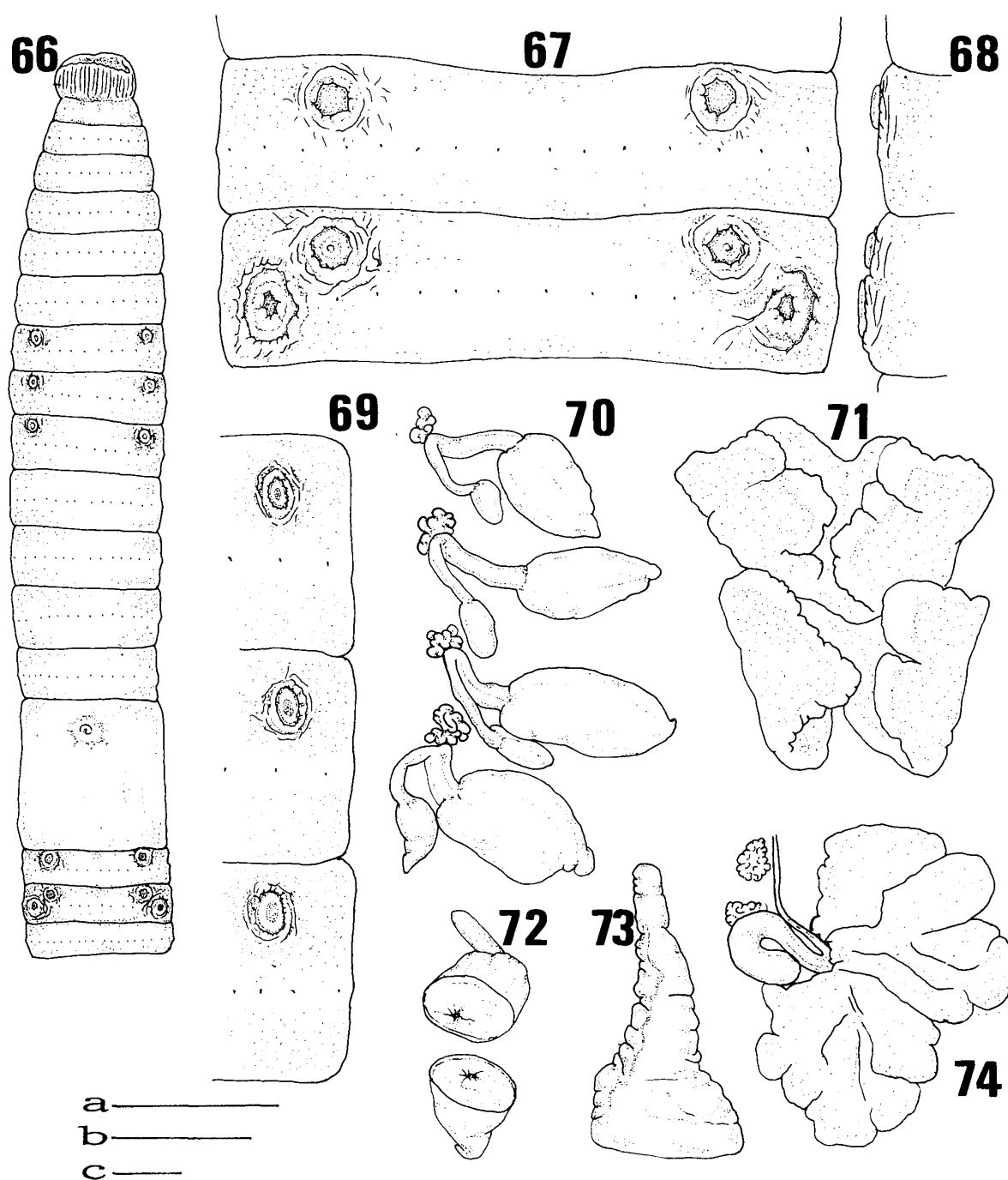
***Pheretima confusa* sp. nov.**

[New Japanese name: Baratsuki-mimizu]

(Figs. 66–74, Tables 4, 6)

Description. Body. Length 100–145 mm, width 3.3–4.0 mm. Number of segments 80–120. Light reddish brown dorsally, light yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrow 5/6/7/8/9, in ventro-lateral side, separated by a distance of ca. 1/3 body circumference.



Figs. 66–74. *Pheretima confusa* sp. nov. Holotype (NSMT-An 275). 66: Ventral view of anterior body. 67: Male pores on segment XVIII and genital markings on segment XIX. 68: Lateral view of segments XVIII–XIX. 69: Ventral view of segments VII–IX. 70: Spermathecae and glandular masses. 71: Dorsal view of seminal vesicles. 72: Dissection of the spermathecae. 73: Intestinal caecum. 74: Prostate gland and glandular masses. (Scale bars. a: 5 mm for 66, 79, b: 5 mm for 67–69, c: 1 mm for 70–74.)

Table 4. The number, arrangement and position of genital markings of *Ph. confusa* sp. nov. Fifteen individuals from Tokyo.

No.	Preclitellar					Postclitellar		
	V	VI	VII	VIII	IX	XVII	XVIII	IX
1	0	0	1 pair	1 pair	1 pair	1 pair	1 pair	0
2	0	0	0	1 pair	1 pair	1 pair	1 pair	0
3	1 pair	2 pairs	2 pairs	2 pairs	1 pair	1 pair	1 pair	0
4	1 pair	1 pair	1 pair	1 pair	0	1 pair	1 pair	0
5	0	0	0	1 pair	1 pair	1 pair	1 pair	one side
6	0	0	1 pair	1 pair	2 pairs	1 pair	1 pair	0
7	1 pair	1 pair	2 pairs	3 pairs	2 pairs	1 pair	1 pair	one side
8	0	0	1 pair	2 pairs	2 pairs	1 pair	one side	0
9	0	0	1 pair	1 pair	0	one side	one side	0
10	0	0	0	0	1 pair	1 pair	1 pair	one side
11	0	1 pair	1 pair	1 pair	1 pair	1 pair	1 pair	1 pair
12	1 pair	1 pair	1 pair	1 pair	0	1 pair	1 pair	one side
13	1 pair	1 pair	1 pair	1 pair	0	one side	1 pair	0
14			2 pairs	2 pairs	2 pairs	one side	1 pair	1 pair
15	0	0	0	0	0	one side	1 pair	one side

Genital markings paired, circular to oval sucker-shape; preclitellar slightly median to the line of the spermathecal pores, presetal on segments VII–IX, closely associated with the spermathecal pores, postsetal on segments VI–VIII, variable in the number; postclitellar slightly median to the line of the male pores, presetal on segments XVII–XVIII and occasionally XIX, variable in the number. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, midventrally on segment XIV. First dorsal pore beginning in furrow 11/12 or 12/13. Clitellum including segments XIV–XVI. Setal number 30–34 in segment VII, 38–42 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 3–4 segments. Intestine begins in XVI. Genital glands paired, glandular masses, on segments VI–IX and XVII–XVIII, variable in the number, associated with genital markings restricted to body wall. Septa absent in 8/9/10, very thickened in 5/6/7/8 and 10/11/12/13/14. Four pairs of spermathecae, in segments VI–IX; ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a duct. Seminal vesicles large, extending to the dorsal line in segments XI–XII. Prostata very large, extending through segments XVI–XXI, duct associated with the male pores.

Material examined. Holotype (NSMT-An 275) and 3 paratypes (NSMT-An 276): Mt. Takao, 15–IX–1985, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees. Other specimens examined: 4 exs. with same data as the

type series. 7 exs. Mizunesawa, 7-IX-1985. 7 exs. Mt. Mitake, 21-IX-1985. 3 exs. Minedani, 7-IX-1985. 2 exs. Mt. Kumotori, 6-IX-1986. All the specimens were collected by the authors.

Remarks. The new species resembles *Pheretima heterochaeta* Michaelsen 1909, but is distinguishable from the latter species by (1) serrate intestinal caeca, and (2) the body length 100–145 mm (33–37 mm in *Pheretima heterochaeta*).

***Pheretima nipparensis* sp. nov.**

[New Japanese name: Nippara-mimizu]

(Figs. 75–84, Tables 5–6)

Description. Body. Length 150–155 mm, width 5.0–5.3 mm. Number of segments 134–138. Reddish brown dorsally, light yellowish grey ventrally.

External characters. Four pairs of spermathecal pores situated in furrows 5/6/7/8/9 in the ventro-lateral sides, separated by a distance of ca. 1/3 body circumference.

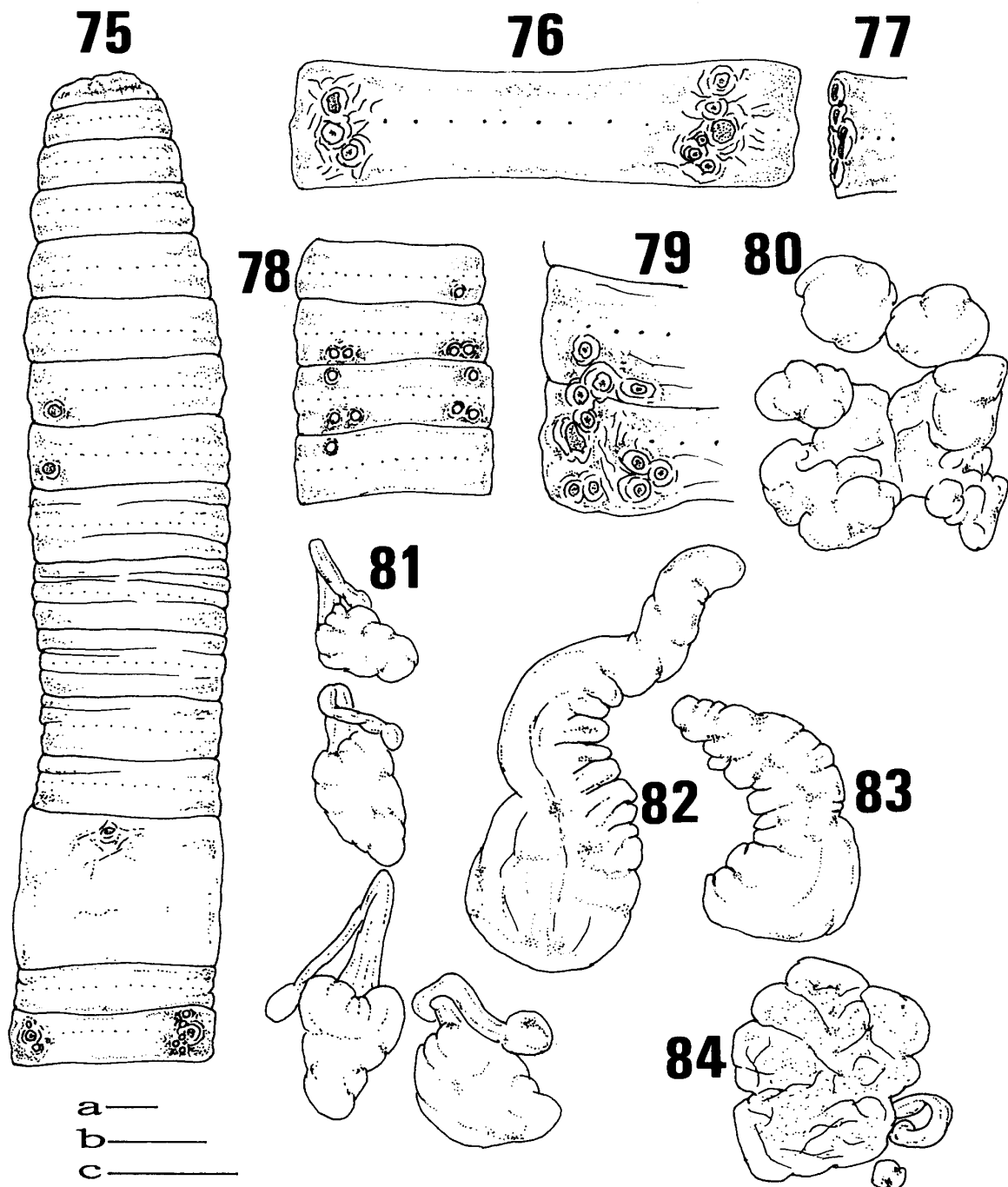
Table 5. The number, arrangement and position of genital markings of *Ph. nipparensis* sp. nov. Two individuals from Ohtanba Valley, Tokyo.

No.	Preclitellar				Postclitellar		
	VI	VII	VIII	IX	XVII	XVIII	IX
1	one side	2 pairs	3 pairs	one side	3 and 1*	3 and 7	one side
2	0	one side	one side	0	0	2 and 4	0

* Three on the one side and one on the other side.

Table 6. Characters of the five related species without genital markings of the genus *Pheretima*.

	Intestinal caeca	Genital markings		Body length	Dorsal coloration
		Preclitellar	Postclitellar		
<i>Ph. heteropoda</i> (Goto et Hatai)	Simple	Presetal on segments VI–IX	Absent	90–220 mm	Greenish brown
<i>Ph. divergens</i> (Michaelsen)	Serrate	Presetal on segments VI–IX	Presetal on segment XVII	90–220 mm	Brown
<i>Ph. autumnalis</i> sp. nov.	Serrate	Absent	Postsetal on segment XVII	95–155 mm	Reddish brown
<i>Ph. confusa</i> sp. nov.	Serrate	Presetal on segments VII–IX	Presetal on segments XVII–XVIII	100–145 mm	Light reddish brown
<i>Ph. nipparensis</i> sp. nov.	Serrate	Postsetal on segments VII–IX	Pre- and postsetal on segments XVII–XVIII	150–160 mm	Reddish brown



Figs. 75–84. *Pheretima nipparensis* sp. nov. 75–77, 80–84: Holotype (NSMT-An 277). 78–79: Paratype (NSMT-An 278). 75: Ventral view of anterior body. 76: Male pores and genital markings on segment XVIII. 77: Lateral view of segment XVIII. 78: Ventral view on segments VI–IX. 79: Lateral view of segments XVII–XVIII. 80: Dorsal view of testes and seminal vesicles. 81: Spermathecae. 82–83: Intestinal caecum. 84: Prostate gland and glandular masses. (Scale bars. a: 1 mm for 75, 78, b: 1 mm for 80, 84, c: 1 mm for 79, 81–83.)

Genital markings paired, circular to oval sucker-shape; preclitellar median to the line of the spermathecal pores, pre- and postsetal on segments VII–IX, variable in the number; postclitellar in line with the male pore to median to the line of the male pores, pre- and postsetal on segments XVII–XVIII, variable in the number and situation. Male pores simple, on medium-sized porophores, superficial on segment XVIII, separated by a distance of ca. 1/3 body circumference. Female pore single, mid-ventrally on segment XIV. First dorsal pore beginning in furrow 12/13. Clitellum including segments XIV–XVI. Setal number 43–52 in segment VII, 52–64 in segment XX.

Internal characters. Serrate intestinal caeca, paired, originating in segment XXVII, extending anteriorly for 2–3 segments. Intestine begins in XV. Genital glands small, paired, glandular masses, on segments VI–IX and XVII–XIX, occasionally lacking, associated with genital markings restricted to body wall. Septa absent in 8/9/10, slightly thickened in 5/6/7/8 and thickened and muscular in 10/11/12/13/14. Four pairs of spermathecae large in segments VI–IX; Ampulla consisting of a shovel-shaped pouch and a thick duct; diverticulum consisting of a oval pouch and a duct. Seminal vesicle small, extending to the dorsal line in segments XI–XII. Prosta through segments XVII–XVIII, corresponding to male pores.

Material examined. Holotype (NSMT-An 277) and paratype (NSMT-An 278): Ohtanba Valley, 18–X–1986, K. Ishizuka, from soil under a mixed forest of evergreen and deciduous trees.

Remarks. The new species resembles *Pheretima heterochaeta* Michaelsen 1909, but is distinguishable from the latter species by (1) serrate intestinal caeca, and (2) the body length 150–155 mm (33–37 mm in *Pheretima heterochaeta*).

Key to the Species of the Genus *Pheretima* s. lat. with Serrate Intestinal Caeca.

1. Spermathecal pores three pairs.....*Ph. autumnalis* sp. nov.
- Spermathecal pores four pairs.....2
2. Genital markings present.....3
- Genital markings absent.....9
3. Genital markings situated anterior to clitellum (occasionally posterior to clitellum).....*Ph. divergens* (Michaelsen)
- Genital markings situated posterior to clitellum.....4
- Genital markings situated anterior and posterior to clitellum.....8
4. Spermathecae consist of ampulla only.....*Ph. alpestris* sp. nov.
- Spermathecae consist of ampulla and diverticulum.....5
5. Genital glands simple duct type.....*Ph. masatakea* (Beddard)
- Genital glands duct lacking (glandular mass) type.....6
6. Intestinal caeca thin.....*Ph. iizukai* (Goto et Hatai)
- Intestinal caeca thick.....7
7. Diverticulum long twisted-tube.....*Ph. dura* sp. nov.

- Diverticulum consisting of twisted-tube and a terminal club..... *Ph. argentea* sp. nov.
- 8. Genital markings situated presetal on segments VII–IX *Ph. confusa* sp. nov.
- Genital markings situated pre- and postsetal on segments VII–IX *Ph. nipparensis* sp. nov.
- 9. External markings absent..... *Ph. montana* sp. nov.
- External markings present..... 10
- 10. External markings situated anterior and posterior to clitellum *Ph. imajimai* sp. nov.
- External markings situated posterior to clitellum 11
- 11. External markings very large suckers *Ph. turgida* sp. nov.
- External markings medium-sized suckers *Ph. atrorubens* sp. nov.

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